

the claimed polyurethane foam, and to specify those ingredients that are excluded from the mixture. Claim 5 has been amended to provide proper antecedent basis for claim terminology and for editorial purposes. Further, claims 6-10 have been amended to revise their claim dependencies. Support for these amendments can be found throughout the claims and specification as originally filed, e.g., the instant specification at page 4, line 33, page 6, lines 1-12, page 14, line 17-page 15, line 22, and original claims 5 and 26. Thus, no new matter has been added.

As required by 37 C.F.R. § 1.121 (c)(1)(ii), Applicant has provided a marked-up version of the amended claims in the attached Appendix.

II. Rejection under 35 U.S.C. § 102(b)/103(a)

The Office has rejected under § 102(b), as anticipated by or, in the alternative, under 103(a), claims 1-4 and 11-15 over EP 716107 ("EP '107") and claims 1-4 over U.S. Patent No. 4,300,580 to Porosoff et al. ("Porosoff"). Applicant respectfully traverses these rejections.

As initial matter, Applicant points out that claim 1 has been amended to clarify that the rigid polyurethane foam of the claimed invention is obtained: a) "by using non-organic foaming agents from a mixture of ingredients including a water-based foaming agent, at least one polyol, and at least one isocyanate compound," and b) by submitting to reaction and simultaneous foaming a mixture of ingredients which does not include "carbodiimide catalysts containing phospholene oxide" nor "heterocyclic nitrogen containing polyols containing at least two beta-hydroxy terminated carbamate groups."

Moreover, Applicant respectfully submits, as set forth in M.P.E.P. § 2131, that "[a] claim is anticipated only if each and every element as set forth in the claim is found

[in a reference]. . . The identical invention must be shown in as complete detail as is contained in the . . . claim" quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). Further, M.P.E.P. § 2143.01 states, *inter alia*, that "[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so . . ." quoting *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

In the present case, EP '107 and Porosoff do not teach or even suggest all of the elements of the instant claims as amended. In addition, EP '107 and Porosoff do not provide any suggestion or motivation to make modifications to what they disclose in order to obtain Applicant's claimed invention. As such, the present claims, as amended are neither anticipated by nor obvious over EP '107 and Porosoff. Each rejection is discussed in turn below.

1. EP '107

The Office alleges that "EP '107 anticipates or strongly suggests the claimed subject matter." Present Office Action at page 5, par. 6. According to the Office, "[a]ll [that] claim 1 requires is a rigid polyurethane foam consisting of closed cells substantially free therein of optionally halogenated hydrocarbon foaming agents." *Id.* at page 4., par. 6. Applicant respectfully disagrees with the Office's reasoning.

In particular, EP '107 relates to the manufacture of heat insulation panels comprising plates and modified polyisocyanurate foams. See page 2, lines 5-6. EP '107 aims at providing heat insulation panels having low friability, high compression strength, excellent flame-retardancy, and high adhesion to plates without recurring to

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the known blowing agents, including chlorofluorocarbons. See *id.*, lines 22-35.

According to EP '107, the invention is achieved by a heat insulation panel comprising a foam of modified polyisocyanurate, which is provided by a reaction of:

- i) a polyisocyanate,
- ii) a polyol,
- iii) water, and
- iv) an **aromatic compound** represented by one of the formulas (I) and (II), in the

presence of a first catalyst promoting isocyanurate linkages and a second **catalyst of phospholene oxide promoting carbodiimide linkages**. See *id.*, lines 40-42 and claim 1 (emphasis added).

Further, as disclosed by EP '107, the aforementioned aromatic compounds of formula (I) and (II) constitute the essence of the foam, since they are said to improve the adhesion and compression strengths and the friability of the foam itself. See page 3, lines 5-8. The carbodiimide catalyst promotes the formation of carbodiimide linkages associated with the evolution of part of the carbon dioxide, which acts as the sole blowing agent of the foam. See *id.*

As further explained at page 11, lines 37-54 of EP '107, the aforementioned combined use of a carbodiimide catalyst and of an aromatic compound of formula (I) or (II) is critical to obtain a carbon dioxide-blown foam having good adhesion strength and high compression strength, since it:

- i) generates the desired blowing agent (carbon dioxide) in two ways, i.e., by means of the formation of carbodiimide linkages and by means of the reaction of polyisocyanate with water, and

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ii) limits the adverse effects of this second mechanism of carbon dioxide generation (friability, low compressive strength, and low adhesion to a substrate) due to the presence of the specific aromatic compound of formula (I) or (II).

By contrast, the rigid polyurethane foam of instant claim 1, as amended, excludes the presence of any carbodiimide catalysts containing phospholene oxide. See M.P.E.P. § 2141.02, *citing W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983) ("A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention."). Moreover, there is no suggestion in EP '107 to modify the reference to exclude the catalysts, as the reference explicitly characterizes the carbodiimide catalysts as essential to the invention. Thus, as the present invention is neither taught nor suggested by EP '107, Applicant respectfully requests withdrawal of the rejection for at least this reason.

Applicant notes that the Office alleges that the properties of the present invention would be inherently present in EP '107, i.e., the adhesion strength, percent linear dimension variation, friability, and heat conductivity. Applicant submits, however, that among other things, the friability data given in Table 1 of EP '107 (page 14) shows that the friability of the foam disclosed by EP '107, as measured by the very same standards (ASTM C421, see page 13, line 34-35), is an order of magnitude worse than the foam of the present invention.

In addition, taking into account that the sole expansion mechanism of the foam of the present invention is the reaction of polyisocyanate with water, the effects of which are disclosed by EP '107 to be detrimental with respect to both adhesion and friability

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(page 2, lines 26-28 and page 10, lines 28-29), there would be no motivation to alter the foam starting ingredients, as taught by the present invention, with a reasonable expectation of success. See *In re Vaeck*, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991) (citing *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988)); see also M.P.E.P. 2143 (indicating that the Office must show that a prior art reference, taken alone or in combination would have suggested to or provided motivation for one of ordinary skill in the art to make the claimed invention, and would have provided one of ordinary skill with a reasonable expectation of success in so making). Accordingly, the rejection is improper and should be withdrawn for these reasons as well.

Finally, Applicant submits that if the carbodiimide catalysts containing phospholene oxide were removed from the foam starting ingredients, as required by amended claim 1, this would render the foam taught by EP '107 inoperable for its intended purpose. In particular, the removed ingredients are essential for achieving the stated object of providing heat insulation panels having low friability, high compression strength, excellent flame-retardancy, and high adhesion to plates, without recurring to the known blowing agents (including chlorofluorocarbons). As such, the rejection is improper and should be withdrawn for this additional reason.

2. Porosoff

The Office alleges that "Porosoff anticipates or strongly suggests the claimed subject matter." Present Office Action at page 5, par. 7. According to the Office, "[a]ll [that] claim 1 requires is a rigid polyurethane foam consisting of closed cells

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substantially free therein of optionally halogenated hydrocarbon foaming agents." *Id.*

Applicant respectfully disagrees with the Office's reasoning.

In particular, Porosoff relates to hydroxyalkyl carbamylalkylated polyols and polyol compositions for use in the manufacture foamed polymers. See col. 1, lines 6-7. Porosoff aims at providing 100% water blown rigid polyurethane and polyisocyanurate foams having improved properties, such as improved retardance to burning, finer cell-structure, better insulation properties, good friability, and improved dimensional stability in comparison to water blown foams of the prior art. See col. 3, lines 11-24.

Moreover, the invention of Porosoff is achieved by a rigid polyurethane and/or polyisocyanurate foam having predominantly closed cells comprising a product of reacting:

A. (i) an organic polyisocyanate, or (ii) an organic polyisocyanate and a trimerization catalyst in an amount effective to produce a urethane-urea-modified isocyanurate;

B. a polyhydroxy-containing material comprising:

(i) a **heterocyclic nitrogen reactant containing two or more beta-hydroxy urethane groups**, or (ii) a combination of B (i) and at least one other polyhydroxy-containing material; and

C. a blowing agent.

See *id.*, lines 54-68 (emphasis added).

According to Porosoff, the improved properties of the disclosed 100% water blown rigid polyurethane and polyisocyanurate foams are achieved by the presence of a critical ingredient, i.e., the heterocyclic nitrogen reactant containing two or more beta-hydroxy urethane groups. See, e.g., col. 4, lines 41-58 and col. 5, lines 30-32.

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By contrast, the rigid polyurethane foam of instant claim 1, as amended, excludes the presence of any reaction product of an organic polyisocyanate with a heterocyclic nitrogen containing polyol containing at least two beta-hydroxy terminated carbamate groups. As such, Porosoff does not meet the limitations of the present claims, and neither has the Office shown that there would be a suggestion to modify the reference to exclude the disclosed polyisocyanate. See *In re Zurko*, 258 F.3d 1379, 1386, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001) (finding that unless "substantial evidence" found in the record supports the factual determinations central to the issue of patentability, the rejection is improper and should be withdrawn). Accordingly, Applicant respectfully requests withdrawal of this rejection for at least this reason.

Applicant notes that the Office alleges that the properties of the present invention would be inherently present in Porosoff, i.e., the adhesion strength, percent linear dimension variation, friability, and heat conductivity. Among other things, however, Porosoff never teaches that improved mechanical and adhesion characteristics of a 100% water blown rigid polyurethane foam may be achieved without using the aforementioned heterocyclic nitrogen containing polyols. In fact, throughout its disclosure, Porosoff never addresses the problem of imparting an improved adhesion to a 100% water blown rigid polyurethane, nor teaches or suggests any foam showing such an improved feature. Accordingly, the rejection should be withdrawn for this reason as well.

Finally, Applicant submits that if the heterocyclic nitrogen containing polyols were removed from the foam starting ingredients as required by amended claim 1, that would render the foam taught by Porosoff inoperable for its intended purpose, since the

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ingredients are essential for providing 100% water blown rigid polyurethane and polyisocyanurate foams having improved properties (such as improved retardance to burning, finer cell-structure, better insulation properties, good friability and improved dimensional stability in comparison with water blown foams of the prior art). As such, the rejection should be withdrawn for this final reason.

III. Rejection under 35 U.S.C. § 103(a)

The Office has rejected under § 103(a), claims 5 and 7-10 over EP '107 or Porosoff, claim 6 over EP '107 or Porosoff in view of U.S. Patent No. 4,328,322 to Baron ("Baron"), and claim 6 over EP '107 or Porosoff in view of U.S. Patent No. 6,020,392 to Kushner et al. ("Kushner"). Applicant respectfully traverses these rejections for the reasons set forth below.

A. EP '107 or Porosoff

As discussed *supra*, both EP' 107 and Porosoff, do not support a rejection based on obviousness, since neither reference teaches or suggests all of the elements of the instant claims. See M.P.E.P. § 2143 (establishing that one of the requirements of a prima facie case of obviousness is that a prior art reference must teach or suggest all claim elements). As such, the rejection is improper for this reason alone.

Moreover, even by combining EP '107 and Porosoff, in the absence of any motivation to do so, there is no evidence in the record that one of ordinary skill in the art would arrive at a foam with the desired properties of the claimed invention, which does not include the carbodiimide catalysts containing phospholene oxide disclosed by EP '107, or the heterocyclic nitrogen containing polyols containing at least two beta-hydroxy

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terminated carbamate groups disclosed by Porosoff. See *In re Zurko*, 258 F.3d 1379, 1386, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001) (finding that unless "substantial evidence" found in the record supports the factual determinations central to the issue of patentability, the rejection is improper and should be withdrawn). Further, as discussed *supra*, the removal of these ingredients would render both of the references inoperable for their intended purpose. Thus, the rejection is improper for this additional reason.

B. EP '107 or Porosoff in view of Baron

Applicant respectfully submits that Baron does not cure the deficiencies of EP '107 or Baron. Specifically, Baron relates to the production of polymeric products such as polyurethane elastomers by the diisocyanate polyaddition process. See col. 1, lines 11-21. Baron aims at providing a system for the production, by a simple and effective isocyanate polyaddition process, of synthetic polymers exhibiting useful physical properties. See col. 2, lines 20-24.

According to Baron, the invention is achieved by reacting a polyisocyanate with substantially an equivalent amount of an oligomeric para-, meta- or di-meta-aminobenzoic acid ester or amide having the formula given at line 35 of col. 2. The utilization of such an oligomeric aminobenzoic acid ester or amide in a polyisocyanate addition process does not require the use of a curative or chain-extending agents which entail a number of disadvantages. See col. 1, lines 21-68; and col. 2, lines 1-2 and 56-65.

Although Baron declares that the synthetic polymers prepared may include polymeric foams (see col. 19, lines 23-27), Applicant points out that it notably fails to teach or suggest:

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1) that the foam has been obtained by using non-organic foaming agents and, in particular, water-based foaming agents, which were known to trigger instability and adhesion problems; and

2) that the foam is a rigid polyurethane foam consisting of closed cells substantially free therein of optionally halogenated hydrocarbon foaming agents.

Additionally and although Baron discloses, among the great multitude of para-, meta- or di-meta-aminobenzoic acid ester or amide, the polyamine defined by instant claim 6, Applicant also points out that:

1) such a polyamine is taught as a reagent that should react with the polyisocyanate in substantially an equivalent amount, i.e., a reagent which replaces the polyester polyol having a minimum functionality equal to 2 and a hydroxyl number of from 250 to 600 as recited in instant claim 1, while the amount of polyamine recited in instant claim 6 is well below such a substantially equivalent amount; and

2) Baron does not teach or suggest that any advantages may be achieved by employing such a polyamine as an additional reactant in proportions well below the "substantially equivalent amount," with the polyisocyanate to obtain the claimed rigid polyurethane foam obtained by using non-organic foaming agents, and comprising a foamed structure consisting of closed cells substantially free therein of optionally halogenated hydrocarbon foaming agents.

Thus, it is evident that the "motivation to improve the mechanical strength of the foam," as alleged by the Office, amounts to an improper hindsight analysis of Baron, taking into account that neither the working examples, nor the other parts of the description, support such a conclusion with regard to a foam. See *Zurko*, 258 F.3d at

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1385, see also *In re Dembiczak* 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references"). Specifically, all of the examples of Baron relate to cast, i.e., solid non-cellular, elastomeric products, and do not support any conclusion with regard to the properties that the claimed rigid polyurethane foam should possess: good heat insulating properties, good adhesion characteristics to the supporting substrate(s) which constitute the building element to be manufactured and also good mechanical characteristics, i.e., low friability. Accordingly, the rejection is improper and should be withdrawn for this reason.

C. EP '107 or Porosoff in view of Kushner

Applicant respectfully submits that Baron does not cure the deficiencies of EP '107 or Kushner. Specifically, Kushner relates to the production of polyurea (PUR) microcellular elastomeric foam using the one-shot method (col. 1, lines 5-7). Kushner aims at providing a system for the production of PUR microcellular elastomeric foam free from the drawbacks of known methods based on NDI-based and MDI/polyester polyols systems. See col. 1, line 11 through col. 2, line 6.

According to Kushner, this object is achieved by reacting a polyisocyanate with a polyol derivative selected from the group of di(aminobenzoate) ester of an oligomeric polyol, i.e. an oligomeric diamine, in the presence of a blowing agent. See col. 2, lines 34-43. The utilization of such a reaction mixture allegedly allows to achieve a number of advantages none of which, however, is one of the properties required by the rigid

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foam of the present invention, i.e., good heat insulating properties, good adhesion characteristics to the supporting substrate(s) which constitute the building element to be manufactured and low friability. See col. 2, lines 60-67; col. 3, lines 1-11.

Additionally and although Kushner discloses, among the great multitude of oligomeric diamines, the polyamine defined by instant claim 6, Applicant points out that:

1) such an oligomeric diamine is taught to be a reagent which should react with the polyisocyanate in at an equivalent ratio of 0.85 to 1 (col. 5, lines 33-34), i.e. is a reagent which replaces the polyester polyol having a minimum functionality equal to 2 and a hydroxyl number of from 250 to 600 recited in present claim 1, while the amount of polyamine recited in claim 6 is well below such an equivalent ratio;

2) Kushner does not teach or suggest that any advantages may be achieved by employing such an oligomeric diamine, as an additional reactant in proportions well below the aforementioned equivalent ratio with the polyisocyanate, to obtain the claimed rigid polyurethane foam; and

3) Kushner teaches not to use polyisocyanate/polyester polyols systems, i.e., the systems of the present invention, which are said to be disadvantageous. See col. 1, lines 51-67 and col. 2, lines 1-6.

Thus, other than using Applicant's disclosure as a template, the "motivation to improve the mechanical strength of the foam," as mentioned by the Office, is lacking in the prior art. As discussed supra, the Federal Circuit has concluded that hindsight analysis is improper. See *Zurko*, 258 F.3d at 1385. In the present case, the Federal Circuit's position is particularly relevant, considering that Kushner neither in the working examples, nor the other parts of the description, supports a conclusion with regard to a

rigid polyurethane foam obtained with a polyisocyanate/polyester polyols reaction system. Accordingly, the rejection is improper and should be withdrawn for at least this reason.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully requests the reconsideration and reexamination of this application and the timely allowance of the pending claims. The Examiner is invited to contact Bryant Young at (202) 408-4328, if any matter may be resolved by a telephone conference.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: January 22, 2003

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APPENDIX

Version with markings to show changes made,
pursuant to 37 C.F.R. § 1.121 (c)(1)(ii)

IN THE CLAIMS:

Claims 1 and 5-10 have been amended as follows:

1. (Amended) A rigid polyurethane foam comprising a foamed structure consisting of closed cells substantially free therein of optionally halogenated hydrocarbon foaming agents, said polyurethane foam being obtained by using non-organic foaming agents from a mixture of ingredients including a water-based foaming agent, at least one polyol, and at least one isocyanate compound;

wherein said mixture of ingredients does not include carbodiimide catalysts containing phospholene oxide and heterocyclic nitrogen containing polyols containing at least two beta-hydroxy terminated carbamate groups; and

wherein said polyurethane foam [having] has an adhesion strength to a supporting substrate, measured according to standards EN 1607, equal to or higher than 0.7 kg/cm².

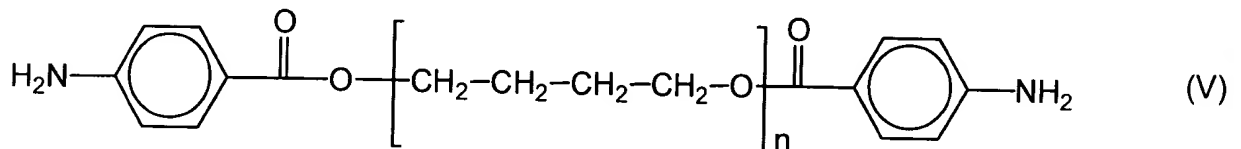
5. (Amended) The polyurethane foam according to claim 1, wherein said [obtainable by submitting to reaction and simultaneous foaming a] mixture of ingredients [comprising] comprises per 100 parts by weight thereof:

- from 10 to 25 parts of at least one polyester polyol having a minimum functionality equal to 2 and a hydroxyl number of from 250 to 600;
- from 50 to 65 parts of at least one isocyanate compound;
- from 1 to 2 parts of a water-based foaming agent; and



- from 0.3 to 2 parts of a suitable surfactant adapted to allow the mutual miscibility between said at least one polyol and said at least one isocyanate compound.

6. (Amended) The polyurethane foam according to claims 1 or 5, wherein said mixture of ingredients further comprises 0.1 to 4 parts by weight of a polyamine having the formula



wherein n is an integer of from 1 to 20.

7. (Amended) The polyurethane foam according to claims 1 or 5, wherein said mixture of ingredients further comprises from 3 to 20 parts of at least one polyether polyol having a minimum functionality equal to 2 and a hydroxyl number of from 150 to 550.

8. (Amended) The polyurethane foam according to claims 1 [4] or 5, wherein said mixture of ingredients further comprises from 5 to 10 parts of at least one halogenated or phosphorated polyol having a minimum functionality equal to 2 and a hydroxyl number of from 240 to 300.

9. (Amended) The polyurethane foam according to claims 1 [4] or 5, wherein said mixture of ingredients further comprises from 4 to 10 parts of a suitable flame retardant agent.

10. (Amended) The polyurethane foam according to claims 1 or 5, wherein said mixture of ingredients further comprises from 0 to 3 parts of a catalyst selected from the group consisting of: foaming, polymerization, and trimerization catalysts.